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TRANSPORTATION

ELECTRONICS

TWO-STAGE PLAN TO AID ELECTRONICS INDUSTRY

Paris L'USINE NOUVELLE in French 7 Jan 82 pp 23-24

[Article by Eric Le Boucher]

[Text] The continuation of the first plan for components was already being prepared before 10 May. The new government will give it an incentive because it considers it as an essential part of the electronics industry. With this in mind, it will speed it up and expand the allocation of aid beyond integrated circuits.

The Ministry of Industry would have preferred to wait six months to a year before deciding on the second plan for components. The first four-year plan, which was started in 1978 will end late in 1982, and "it is still too early to judge its results." The three major plants (Thomson-Efcis, Eurotechnique, and Matra-Harris) have still not completed their scale-up, nor realy found their place in a depressed European market. The ministry also wanted to await the nationalizations and the nomination of the general administrators to define the plan in concert with the new general staffs.

No Upheavals in Role Assignments

But pressures "from above" (it is known that the President of the Republic himself, attaches great importance to integrated circuits) have forced a speed-up: a compromise had to be found. An interministerial council will meet at Matignon around 13 January to complete an interim project which will only cover 1982; the "true" plan will be issued during the year.

The first plan will be continued during 1982: no great changes in major assignments. The agreements with American companies (Saint-Gobain-Eurotechnique with National Semiconductor, Matra with Harris and Intel, Thomson with Motorola) are maintained, and will be maintained in the future.

However, with the nominations of general staffs, a coordination will be studied in the major nationalized companies to eliminate duplications ("Is it reasonable in France, to finance three teams for an 8-bit microprocessor?" the Ministry of Industry asks itself), and to eventually modify some structures. The government wants to encourage larger international associations. Everyone thinks of Europe.

The "true" plan is for the most part defined. Matignon now has to arbitrate the budgets, which will be "at least doubled," and probably increased even more (the first plan had cost 800 million francs over a period of four years). It will have two objectives: move even faster in industrial investments and research; and expand (beyond integrated circuits, government aid will for instance cover passive circuits, hyperfrequency, connection technology, and such other technologies as ceramics). With the strategy of biting into the market growth rather than into the strength of the competition.

The expansion will also cover equipment assets for components (which was expected) and associated services (which was less expected). The government will assist the creation of circuit design and product testing. In a larger sense, the thinking in terms of "industry" which guides the industrial policy will lead to a search for better correlations between component production and their sale in all user sectors. And that does not apply only to telecommunications.

11,023
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ENERGY

DANISH RESEARCHERS WORK TO DEVELOP SUPER BATTERIES

Copenhagen BERLINGSKE TIDENDE in Danish 18 Jan 82 p 5

[Article by Jens J. Kjaergaard]

[Text] There is a prospect that the Danish Technical College will become one of the leading universities in Europe when it comes to research work in the area of batteries. Chemical Laboratory A is conducting studies that could lead in the long run to the development of lightweight but still very efficient and rechargeable batteries based on salt melts or in other words the electrochemical storage of energy. Subsidy funds have been provided for preliminary work. Over a 2-year period the State Technical-Scientific Research Council, which has just received a report on the possibilities, granted about half a million kroner for this research.

The laboratory has been studying the chemistry of salt melts for many years under the leadership of assistant professor Niels Janniksen Bjerrum, MS, especially aluminum and sulfur compounds. Both these elements are potential possibilities for electrodes in batteries with high specific energy.

Free Research

On Friday Niels J. Bjerrum will defend a technical doctoral thesis on salt melts, "The Chalcogenes in Chloroaluminate Melts." The thesis describes their properties, balance and the techniques developed for the studies. These involve high temperatures, considerable steam pressure--and extended periods of time.

"This is basic research but the leap to practical application is not great," Niels J. Bjerrum told BERLINGSKE TIDENDE. "At DTH [Danish Technical College] we are now working on the batteries--and we are just about to set up a small test facility on a laboratory scale for the production of sulfuric acid using a process that is an extension of my doctoral work.

"Aluminum, the most important metal in the world next to iron, can also be produced with new methods that save 30 percent of electrical consumption," said Niels J. Bjerrum. "Experiments are being conducted by the big Texas company, Alcoa.

"As far as I can see all this goes to show that the dividing line between basic research and applied research is often artificial. A requirement for political control of science would probably lead to fewer discoveries being made. Research workers must have the freedom to get things started even though their usefulness is not always immediately apparent. Just imagine if 20 years ago a team of scientists had been assigned to find a better garbage can. They would probably have delivered a very functional container of iron without having considered plastic or paper."

Soaring Ideas

Niels J. Bjerrum was born in 1940. He received his Master's degree in chemistry at Copenhagen University in 1964. After that he spent 2 years in Oak Ridge, Tennessee in the United States with professor G. P. Smith. He learned the methods and techniques used in salt melts research so that he could continue in this research area on his own when he returned from the United States and was hired as assistant professor with Chemical Laboratory A.

"Incidentally the work at Oak Ridge was an offshoot of a project with a specific goal that was never carried out in practice. At one time there were incredible plans to build an eternally airborne nuclear-powered propellor plane with a light reactor that would be cooled by melted salt. It never got off the ground. But the ideas led to so many other things," said Niels J. Bjerrum.

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BRIEFS

COMES BUDGET INCREASES--The 1982 budget of COMES, which amounts to 309.5 MF, is 48 percent higher than that of 1981. Of this figure, 26 percent is allocated to direct solar technology, 25 percent to biomass technology, and 22 percent to study and dissemination activities. It is notable that: (1) A significant effort has been approved for the biomass development projects, mainly in the program for substitute biological fuels: the endowment of this sector will go from 50 to 80 MF, for an increase of 60 percent. This evolution will equalize the credit allocations for the direct solar and biomass sectors. (2) Dissemination operations, which were not truly started until 1981, will involve much higher amounts: 70 MF, compared to 31 MF in 1981. (3) The increased allocation for the international program supported by COMES from its own budget (16 MF instead of 11 MF in 1981) will make it possible to strengthen the COMES policy to complement the one carried out with credits from the Concerted Action Fund (FAC). [Text] [Paris SEMAINE DE L'ENERGIE in French 21 Dec 81 p 13] 11,023

SOLAR POWER PLANT DAMAGED-- According to the Alpes-Maritimes Equipment Directorate of Electricite de France, a violent wind, which blew in squalls on 19 December throughout the Mediterranean region, has seriously damaged the heliostat field of the Themis solar power plant at Targassone (Pyrenees-Orientales). The Targassone solar power plant (see AFP SCIENCES No 265 of 4 June 1981, pages 22 to 24) is an experimental installation which includes 200 flat-mirror heliostats with an area of 50 square meters, equivalent to a total reflecting surface of one hectare. Themis is considered as a solar-electric plant prototype for developping nations devoid of all other sources of energy. [Text] [Paris AFP SCIENCES in French 24 Dec 81 p 40] 11,023

NETHERLANDS: WIND ENERGY--The Dutch minister of the economy has allocated 32 million florins (72 million French francs) to wind energy research in the Netherlands. In a letter addressed to the Parliament on 15 December, the minister, Jan Terlouw, indicated that this amount will be used for the construction of a prototype large wind turbine (more than 1 megawatt of electric power) and a wind-powered electric generation plant which will be used as a demonstration project. The minister stipulated in the letter, that the studies undertaken indicate that by the year 2000, wind will be able to supply 2000 megawatts for the Netherlands. [Text] [Paris AFP SCIENCES in French 17 Dec 81 p 45] 11,023

CSO: 3102/133

GOVERNMENT REVEALS PLAN TO MODERNIZE MACHINE TOOL INDUSTRY

Paris L'USINE NOUVELLE in French 10 Dec 81 pp 82-83

[Article by Georges Le Gall]

Everything for numerical control (NC). That is the guideline of the plan proposed by Pierre Dreyfus for the machine-tool industry: research and development efforts, restructuring of the sector around specialized machines, and creation of foreign subsidiaries will be needed to prime a renewal. With the help of the government, of course.

On the day following the session of the Council of Ministers of 2 December, which examined and approved the development program of the French machine-tool industry, Pierre Dreyfus boldly defined the expected evolution--year by year, from 1982 to 1985--of French production and of the domestic market demand for NC machines (see tables).

We say boldly, because in disclosing detailed forecasts, should the goals not be met, the Ministry of Industry leaves itself exposed to conistant reminders that this new plan is a failure.

The fundamental idea of the program, revealed to L'USINE NOUVELLE last week (see No 49 of 3 December, p 66), is to very rapidly develop production and demand for NC machines. Thus, while the total French production of machine-tools in constant francs should grow by more than 75 percent between 1982 and 1985 (from 4.1 to 7.4 billion francs), that of conventional machines should decrease slightly, and that of heavy machinery should be stable; at the same time, the production of NC machines would almost quadruple (from 1.2 to 4.6 billion francs). This would correspond to an annual growth of 50 percent for NC machines, representing over 60 percent of the total value of French production in 1985, compared to 30 percent in 1982.

On the other hand, Pierre Dreyfus did not provide very detailed figures on the expected French foreign trade of machine-tools in 1984-1985. But he did indicate that the goal was to have a surplus in the balance of trade. First, by developing exportations, notably in industrialized countries: between 1981 and 1984-1985, for instance, foreign sales would increase from 30 percent to 50 percent of the NC lathe production, and from 5 percent to 30 percent of the machining center production.

Figures for objectives: expected growth in the turnover of the Fremch industry (in constant million francs).

	1981	1982	1983	1984	1985
NC machines	1100	1200	1900	3050	4600
Conventional machines	1500	1400	1400	1350	1300
Heavy machines	1500	1500	1500	1500	1500
Total	4100	4100	4800	5900	7400

Source: Ministry of Industry

Projected development of NC machines on the French domestic market (in numbers of machines).

	1981	1982	1983	1984	1985
Lathes	1000	1000	1340	1800	2400
Machining centers	250	550	550	1100	1500
Milling machines	250	250	380	590	750
Other machines	500	500	610	735	900
Total	2000	2100	2880	4225	5550

Source: Ministry of Industry

Secondly, by recapturing the domestic market: during the same period, the share of importations in the total French demand would decrease from 60 percent to 30 percent for NC lathes, and from 70 percent to 35 percent for machining centers. All of it without protectionism, thanks to a French industry which becomes competitive once more.

These ambitious objectives should be attained primarily through development contracts between the government and some 15 enterprises. In exchange for public support, these enterprises would pledge to specialize in a given line of products, standardize components, devote about 5 percent of their turnover to research--part of which will be subcontracted outside organizations, train and hire highly qualified personnel, and increase their business in France and abroad.

An Investment of 4 Billion Francs

As an overall figure, the three-year (1982 to 1984) investment involved in the renewal of the French machine-tool industry (recovery of private funds, investments, research and development) is estimated at 4 billion francs (which is the exact figure suggested by L'USINE NOUVELLE in its issue of 8 October 1981). This amount is equal to the turnover of the machine-tool industry in 1981, and represents about 25 percent of the business forecast for the three years 1982-1983-1984.

Of this total, 2.3 billion will be contributed by the government in various forms (loans, innovation support, industrial policy credits) from various ministries (Industry, Finance, Research, Labor). The Ministry of Industry estimates that shareholder contribution should amount to about 600 million francs. We must not forget that if the size of machine-tool enterprises is small (the three largest employ only 2000 persons each), the major enterprises (with the exception of Line) are part of large groups: Renault, Empain-Schneider (Ernault-Somua), Peugeot (Citroen), Suez (Hure), CGE (Graffenstaden), Snecma (Berthiez), Matra (Manurhin and Sagita), IDI (TMI), Gulf and Western (Bliss). The remainder of about 1 billion francs would be supplied by financial institutions.

The research and development effort for really new machines on the part of enterprises, which currently does not exceed 1 percent of the turnover, should quadruple to 200 million francs in 1984. A budget of the same magnitude should be available in technical and university organizations: the Center for Machine-Tool Study and Research, and the Superior National School for Arts and Trades will be in charge of machine design. The Agency for the Development of Automated Production will be responsible for the automation of production systems, and the Technical Center for the Mechanical Industries, will be responsible for material shaping processes.

Also during the 1982-1984 period, the modernization of production equipment should absorb 1.2 billion francs (or 8 percent of the turnover, compared to the current 2 percent). Both in terms of components (numerical controls, electric motors, speed controls, spindles, axles, and so on), and of complete machines, the goal is to achieve very high productivity gains, since it is expected that the actual number of employees in the sector (19,000 persons) will remain stable despite a very high production increase. While the number of low qualification jobs will decrease, that of assembly, repair, design, and supervisory positions will increase, implying a training policy for 2000 persons.

Aid Negotiated Case by Case With Enterprises

Each year, 150 million francs are allocated for the creation of foreign subsidiaries. But the development of exportations also implies agreements (acquisitions or capital participations) with foreign partners, notably in the United States, West Germany, and--why not?--Japan. The credits necessary for these operations are not included in the investment of 4 billion francs: in this domain, public support will be negotiated case by case with the enterprises.

To be effective, these efforts of research, productivity, and formation of networks abroad, assume a restructuring of the French industry. This requirement is now accepted. Since 2 December, one such modification has already occurred: Empain-Schneider will negotiate with Hure and CIT-Alcatel (subsidiary of CGE) to bring its Ernault-Somua subsidiary to a new group, directed by Hure, which would include Graffenstaden (machine-tool department of CIT-Alcatel). This new group would be diversified: it would produce standard models of NC lathes and milling machines, as well as machining centers.

The entire French machine-tool industry will thus change its aspect, since several other agreements are being planned; the present probabilities are:

Lathes: Cazeneuve, Ramo, Mechanical Innovation Company.

Milling machines: Dufour (recently reacquired by Profel) could enter into a new group under the direction of Vernier; Gambin (which is presently in the Line group) would rejoin this group or would enter into the group Ernault-Somua-Graffenstaden-Hure.

Grinders: the government is hesitating between a single group or a two-group formula. In the latter case, one would be formed under the direction of Constructions de Clichy (Renault group) with Gendron (currently in the Line group), and the other by such enterprises as Microrex and SIT.

Line would thus specialize in heavy cutting machines. Here again, the government is hesitating between one group or two. In the latter case, there would be an boring-milling machine group with Line and TMI, and a lathe group with Line and Berthiez.

Large presses: Bliss and Spiertz.

While granting that the decisions of 2 December prove that the government has finally decided to save their industry, and while admitting the usefulness of regrouping, the first concern of builders at this time is orders. A number of enterprises operate at only 50 percent of their capabilities and for 32 hours per week.

Given the 1981 drop in orders, the simple maintenance of the 1982 production at its 1981 level (an assumption made by the Ministry of Industry) already implies a renewal of orders, notably of orders from the domestic market. It is obvious that orders from the Ministry of National Education (which will amount to 400 million francs in 1982 and will remain at that level in 1983 and 1984) will not suffice as a solution. Nor will the investment effort expected from nationalized and nationalizable enterprises. It is imperative that the French industry as a whole begin to reinvest: but that is the whole problem of the relationship between the government and private industry.

Immediate Objective: Begin by Recovering the Delay

Even if the 1984-1985 objectives are achieved, we must not form any illusions: the French builders will only have recovered part of the time lost in recent years while their major competitors were progressing (Japan, West Germany, Italy, United States). Even if the goals are attained, the French NC machine production in 1984 will still represent only 7-8 percent of the world production (which at that time will be 65,000 to 70,000 machines, compared to 40,000 to 45,000 in 1980). The Japanese will still retain their 50 percent share of the world market in this domain. And the French inventory of NC machines will be only one-sixth of the Japanese one, while Japan's gross national production is only twice that of France.

Nevertheless, if these objectives are achieved, the French machine-tool industry will finally have become competitive and profitable. It will be able to pursue its development without government subsidies. But the machine-tool inventory of the entire French industry will have been extensively modernized: how does the government expect to reconcile the resulting productivity increases--which are absolutely necessary for French industry to be competitive--with the maintenance of employment in the industry?

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USE OF INDUSTRIAL ROBOTS INCREASING IN DENMARK

Copenhagen BERLINGSKE TIDENDE in Danish 1 Feb 82 p 2

[Article by Erik Bendt Rasmussen]

[Text] Following a tough pioneer period an opening has been created for the introduction of robots in Danish industry. Estimates of the number of robots were too optimistic 10 years ago but now it appears that a new development is taking place.

Many more robots should be used in Danish industry. The entry of robots in firms has occurred much more gradually than anticipated 10 years ago. Now industry must be inspired to introduce more robots. For the first time Danish and international expertise on robots will get together on 3 February for a conference at the Technological Institute in Tastrup.

Industrial robots perform work that is monotonous and hazardous to human health. Today around 90 robots are functioning in Danish industry, engaged in spray painting, welding, assembly and handling. It was estimated 10 years ago that by the end of the 1970's about 800 robots would be operating in industry. The estimate was inaccurate. The market recession came and with it the fear that robots would take over jobs. At the beginning of 1981 only about 65 robots had been installed. But about 25 were added during the year. The attitude toward robots has changed very gradually. It has been documented that robots do not steal jobs.

The Technological Institute believes that the number of robots in Danish industry will grow by around 25 units annually in the next few years so that by 1985-1990 there will be from 250 to 300 robots working in industry.

Robots Learn Easily

The definition of an industrial robot is: "A programmable handling machine that without continuous supervision can carry out the positioning of tools or materials with reference to one or more fixed patterns of movement." The brain of the robot is of course a computer containing the program of work the robot is to perform. There are robots that in a manner of speaking can work on their

own. When the robot must learn to deal with something the operator only has to guide the robot's arm once. After that the computer remembers the movements.

In the early 1970's when robots began to gain ground opponents and organizations made prophesies and statements ranging from the entirely pessimistic to the totally ridiculous. Many firms shrank from buying robots because there was no expertise in Denmark and the firms themselves were ignorant of the technology. The picture has changed. There is a lot of experience today at the technological institutes, at DTH [Danish Technical College], the Welding Center and the Institute for Product Development, among others. For example the Technological Institute has three reports on industrial robots in Denmark.

"We are able to advise industries that are considering acquiring robots and we can use the robots we have at the Technological Institute to test whether productions are suitable for robots, for instance the painting of items. At the moment we are testing production for a factory that is considering buying a robot to enamel chairs," said engineer Bo Petri Jeppesen of the TI [Technological Institute] automation division.

It isn't done by simply buying a robot. A new system of production supervision must be introduced, the layout of the factory must be changed and a computer must be bought for the robot. In addition accessory equipment must be constructed. This is the equipment that conveys items to and from the robot and turns the items to fit the movements of the robot. Some robots have only a few arm motions, other types have more. Accessory equipment can often cost as much as the robot whose price is typically around 400-500,000 kroner for the more advanced types. Before a robot is acquired operating economy estimates must be made to see if the robot will pay for itself. Since it works quickly and continuously problems can arise with regard to room for the products and whether they can be sold as quickly as the robot works. And last but not least there must be talks with the staff on introducing one or more robots and training the people who will service the robot.

Where Robots Operate

Among industries having a robot is Danish Hospital Fixtures where a robot welds bedframes together. At Louis Poulsen & Co. robots spray paint parts for lighting equipment and at the Oticon factory five robots plate small wires and metal parts for hearing aids. In the plastics and foundry branch a number of robots are employed to remove hot items from casting equipment.

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SCIENCE POLICY

MINISTER PRESENTS BROAD OUTLINES OF NEW SCIENCE STRATEGY

Paris AFP SCIENCES in French 7 Jan 82 pp 1-2

[Article entitled "Major Guidelines of the Draft for an Orientation and Programmation Law for Technical Research and Development"]

[Text] Jean Pierre Chevenement, minister of research and technology, presented to the Council of Ministers on 6 January, the major guidelines of the future draft for an orientation and programmation law for technologic research and development. The minister had already presented a communication on this subject to the Council of Ministers on 23 December, but it had been relatively brief because the agenda was particularly crowded as a result of the Polish situation.

On 5 January, an Interministerial Committee on Research met at Hotel Matignon, chaired by the prime-minister, Pierre Mauroy. He was attempting to effect a number of budgetary arbitrations. However, as is customary at the end of such meetings, the communique was rather terse about the decisions that were taken, or those which could not be taken.

Attending this meeting in addition to Mr Chevenement, were Alain Savary, minister of national education, Anicet Le Pors, minister in charge of public functions, and Laurent Fabius, minister of the budget.

The communique of the Council of Ministers of 6 January specified the following points regarding Mr Chevenement's presentation:

This law will first of all establish the major directions of the research and technologic development policy, an ambitious policy from training to research; it acknowledges the specificity of research trades, whose general principles it will establish; the democratization of research institutions; the assertion of the role played by various regions; the valorization of French research for the benefit of the national collectivity, and the simultaneous inception of social progress in favor of research personnel; the importance of scientific information and technical education; and the development of international cooperation.

The law will specify the programmation of the major means to be used within the framework of these orientations, and as is customary for any multi-annual involvement, will take into consideration general balances.

The goal established by the President of the Republic, to bring research and development efforts to 2.5 percent of PIB (Gross National Product) in 1985, is a concrete expression of this ambition. Its achievement implies a significant increase in research and innovation efforts in enterprises, efforts which today are lagging far behind those of our major international partners; incentives will be used to this end; but the public research effort--supported by a vigorous policy of research personnel recruitment, which the Interim Plan indicated should grow at an average rate of 4.5 percent per year--will have to outpace and lead that of enterprises. Taking into account the provisions of the plan regarding the evolution of the other components of the public budget effort, the volume of the civilian R and D budget should grow by 17.8 percent per year.

The fulfillment of this objective will have to be examined each year so as to monitor the other components of the DRND (National Directorate for Research and Development). This effort will make it possible to simultaneously guarantee basic research, pursue the completion of the large programs of technologic development, and start on new topics, mobilizing programs that will combine basic research, applied research, and technologic development for large objectives of national interest. The goal is to provide France with the means of successfully carrying out the scientific and technologic revolution in all fields, and to make the country able to respond to the challenges of the future.

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SCIENCE POLICY

ADOPTION OF 1982 BUDGET MARKS BREAK WITH PAST

Paris AFP SCIENCES in French 26 Nov 81 pp 1-7

[Text] On 19 November the National Assembly adopted the budget for research and technology, which amounts to more than 25 billion francs; according to Mr Jean-Pierre Chevenement, [minister of state for scientific research and technology], this constitutes "an effort for which there has been no precedent in over 10 years" and marks a "positive and decisive break with past trends."

For the minister, the 29.4-percent increase in his budget demonstrates "the willingness of the public powers to make the indispensable fresh start in research efforts, provided that industry's contributions reach 30 billion francs in 1982, as compared to 21.7 billion francs in 1980. With public financing, for its part, being close to 45 billion francs, there is good reason to believe that the national effort in research and technological development will reach 2 percent of the gross domestic product in 1982."

Mr Chevenement emphasized "the decisive role" which must be played by both public and private business firms, which currently are financing 33 percent of the national research effort (half of which is insured by nationalized and nationalizable business firms as a whole).

He felt, however, that this effort in the field of research by business firms was still insufficient in comparison with the results of other countries like the FRG and Japan, and consequently he hoped that this effort could grow in volume by at least 8 percent per year.

"To give industrial research and innovation indispensable second wind, a major asset will be available to us: the existence of a broadened public sector," the minister said.

For Mr Chevenement, national business firms "must take a leading role in the development of the channels of the future," such as biotechnology, mechanization, electronics, etc.

Mr Chevenement likewise insisted on the role which small and medium industries must play, and in this regard he indicated that he had asked that a study be done on "the means to be put into effect to overcome the obstructions which deprive "these industries] of the beneficial outcome of national research." He indicated that

fiscal incentive measures for developing research in business firms had been taken up with the ministers of the budget and of economy and finance. These measures could not, in any event, be applied before the 1983 budget.

The opposition criticized what it called "the witch hunt within the National Center for Scientific Research (CNRS)." "You asked for heads; so here is the decapitated CNRS," said Mr Claude Birraux (UDF-Haute-Savoie), while Mr Gilbert Gantier (UDF-Paris) affirmed that "no Marxist science existed." The minister of research indicated that he "wanted to put an end to the myth about heads chopped off: there has not been any cutting off of heads. They flew off by themselves; it was a spontaneous movement."

"After years of smothering, suffocating, witch-hunting, we want to install pluralism. I do not know what Marxist science is, but I know very well what goods are hidden behind anti-Marxism. I am in favor of tolerance."

For his part, Mr Guy Hermier, Communist deputy from Bouches-du-Rhone, wished that "profit-motivated steering, a sinister reminder of Giscardian ways, could be replaced by a stimulation toward research and innovation motivated by social and national needs and their democratic expression."

In conclusion, Mr Jean-Louis Masson (RPR-Moselle) made a speech in defense of the use of the French language in the field of science.

Here are the major excerpts from Mr Chevenement's speech:

Regarding the overall effort by business firms:

The objective which the government set for itself of bringing the internal expenditures for research and development up from 1.8 percent of the gross domestic product in 1980 to 2.5 percent in 1985; i.e., of bringing these expenditures up from 53 billion francs in 1980 to 80 billion (in 1980 francs) in 1985, implies a major effort by all partners in research, business firms as well as public organizations. Here I should like to insist on the decisive role of business firms, which are currently financing 43 percent of the national research effort--half of which is insured by nationalized and nationalizable businesses as a whole. It has to be known that the portion of research financed by industry--0.8 percent of the GDP--remains lower in France than in the countries of our main partners, especially Germany and Japan, where it reaches 1.2 percent.

Work carried out on the occasion of the preparation of the two-year plan showed that the effort of business firms should grow in volume by at least 8 percent annually if the objective which we have set for ourselves for all of the internal expenditures for research and development is to be reached.

In this case, it is a matter of an effort well above the growth of the gross domestic project.

Thus, not only must the research and development effort allowed by business firms be maintained--it would be against their interests, because of temporary difficulties arising from the recession, for certain businesses to reduce their expenses for research and development--but also this effort must, in fact, be greatly increased.

To give industrial research and innovation indispensable second wind, a major asset will be available to us--the existence of a broadened public sector.

National business firms will play a driving role in the development of the channels of the future (biotechnology, mechanization, electronics, etc.); acting within the framework of plan agreements ensuring their autonomy, they will have to grapple with the long-term preoccupation, just as decisive for their future as it is for that of our country. I am likewise counting on them very much to conceive and carry out original means of collaboration with public research laboratories on the one hand, and with other business firms on the other.

Finally, I hope that large national business firms will actively participate in disseminating throughout the industrial field as a whole--particularly among the small and medium industries with which they work--the knowledge which they have accumulated over time and the techniques at their disposal. I shall ask some of them to start up pilot activities in this area. Accordingly, it seems to me that production methods and methods of analyzing technical problems, those which have been developed in large businesses to obtain quality products, should give rise to widespread dissemination within the industrial field.

Moreover, I want to point out that I have requested that a study be carried out concerning small and medium industries and innovation. I hope that it will provide me with new insight into the means that should be employed to overcome the obstructions which deprive small and medium industries of the beneficial outcome of national research and to sensitize them to be concerned about innovation, to help them to innovate.

Possible tax incentives:

In order to give research financed by industry the impetus that it needs, I intend to pursue, with my colleagues in economy and finance and in the budget bureau, the study of a generalized tax measure which might be similar to that which exists not only in Germany but also in Japan, the United States, and Canada.

Several solutions can be envisaged:

The basis for it could be the volume of expenditures for research, as defined by Mr Boudeville's report to the National Council on Accounting. It could also be the growth in [any] one year over the preceding one. Taking into account a magnitude of this sort would make it possible to favor business firms' outside contracts as well as their internal expenditures for research.

The basis for such reform thus could be constituted by the annual hiring of people--researchers and technicians--whose activity would come to strengthen business firms' research and development teams. Of course, this measure, which is in keeping with the spirit of our policy favoring employment, and which would cover 70 percent of the expenditures for internal research, could not be applied until 1982. This analysis is currently being conducted in anticipation of the finance law of 1982 (1983 budget).

Furthermore, I am convinced that a policy of innovation must be accompanied by an adapted financing policy. As a matter of fact, it would be daydreaming to expect business firms to devote important resources to developing new products or to making use of new technologies if they could not subsequently finance the industrialization of them. That is the reason why I am currently having in-depth discussions with Mr Delors, the minister of economy and finance, to determine ways and means that would make it possible to cause the banking network to take into account more effectively than it does at present the problems which arise in connection with the industrialization of new products.

Moreover, the entire lot of currently existing mechanisms for financing innovation must be reexamined in order to strengthen their effectiveness (long-term public credits, INODEV, financial companies for innovation, especially), just as some rethinking must be done with regard to the improvement of research, collective research, and the development of regional technological poles.

Technical centers:

Where technical centers and research centers under contract are more particularly concerned, I attach the greatest importance to their development along four main lines: the opening of upstream research in order to keep them abreast of the new accomplishments of knowledge; the opening of technical research centers through contracts; the creation of devices for associative research in new technical disciplines; the regionalization of technical centers.

Finally, as for the National Agency for the Improvement of Research (ANVAR), its financial and human means for action, especially within the regions, will be greatly increased in 1982, and I expect to make awards for innovation a powerful tool, strengthening their incentive nature by raising their rate and revising their conditions for allotment.

In the speech which he had made on 12 November at the annual banquet of the National Association for Technical Research (ANRT), Mr Chevenement had already devoted quite a bit of time to the problem of technical research centers.

"At midpoint between two worlds that are unaware of each other (the world of public and basic research and that of technological development in business firms), they nevertheless should be one of the essential instruments of communication between themselves," he had emphasized.

Some essential budget components:

Employment:

The draft budget which is being presented to you for 1982 is the first phase of a major project aimed at giving the men and women in research vigor, hope, and the feeling of belonging to the national community. To this end, five types of measures are planned:

First of all, it is a question of going back to a resolute policy of creating jobs. With this goal in mind, 1,727 positions are planned. In order to proceed with

their distribution in terms of the priorities which we shall identify, 320 positions have been temporarily entered for interministerial reserve. The other 1,407 positions allow the creation of 600 jobs for researchers and 807 ITA jobs. During the past 7 years, the annual average of these [job] creations had been limited to 700. The pace has thus more than doubled. I shall see to it that France's law on orientation and programming for research and technological development will ensure this indispensable growth up to 1985. An annual job-creation rate amounting to around 4.5 percent of the manpower on board is probably necessary.

In the second place, there is the matter of putting a stop to the dead-end situation in which the great majority of the personnel in major public research establishments find themselves. Funding has thus been planned so that the number of job conversions will be sufficient to allow satisfactory promotions and the correction of numerous injustices in career development. The rapid improvement of the ITA situation will receive priority treatment in this overall situation.

The training of young people for research and through research: Mr Chevenement referred to the decisions reached quite recently (see AFP SCIENCES No 283) having to do with the raising of allotments for research.

Revision of the statutes:

Aside from these immediate measures, it is advisable to start actively preparing for revision of the statutes on public research personnel. The statutes now in effect are, in fact, inappropriate for the new scientific and technological policy which we hope to develop. They must be completely revised in order to make it possible to attain the objectives of this new policy, and especially to ensure that research will have the quality, the dynamism, and the openness toward society that will be indispensable for its development. This requires a new statute for researchers, engineers, technicians, and administrative employees, one having a legislative basis (and not just a statutory one) so as to make it possible to ensure job guarantees, possibilities for attractive careers capable of leading to different types of activities relating to research, adequate procedures for recruitment and evaluation....

Bringing up to standard the working funds for research teams: "This is a priority task," the minister emphasized.

The draft budget for 1982 pays particular attention to this through a major increase in funding planned under the heading of program and equipment support (average-size material, and major scientific equipment) and through a first reappraisal of funding for tasks.

Thus, for the organizations whose funding is included in the budget of the Ministry of Research and Technology, the overall funding (normal costs and program authorizations) is as follows:

	1981	1982	Percent
CNRS	4,749.3	5,946.2	25.2
INSERM	834.6	1,041.7	24.8
Pasteur Institute, Paris	110.1	143.3	30.2
INRA	1,218.1	1,509.2	23.9
CEA	4,466.3	5,261.8	17.8
CNES	1,677.5	2,145.6	27.9
CNEXO	304.0	400.4	31.7
ISTPM	57.5	92.9	61.6
COMES	199.3	300.0	50.5
ADI	215.5	282.5	31.1
INRIA	113.9	156.9	37.8
ORSTOM	371.0	461.0	24.3
GERDAT	241.9	302.1	24.9

It likewise seems important to me to point out the resources made available to the research mission of the universities within the Ministry of National Education, which are going from 669.4 million francs in 1981 to 858.1 million francs in 1982--that is, an increase of 28.2 percent.

Scientific and technical information:

This, as you know, is a highly sensitive area which aims at the implementation of data bases and banks or the support of the dissemination of scientific knowledge and publishing, but which likewise embraces the whole problem of the influence of our activities in research and technological development and the defense of our language as the worldwide scientific language. It is obviously a matter of a cultural problem in the full sense of the term, and I deem it to be of the greatest importance.

Scientific and technical information, by the diversity of the public to which it addresses itself, is one of the keys to the economic, social, and cultural development of our country, but also to that of the countries linked to us through language or common interests. It is an essential factor in our national independence.

Finally, an active policy for scientific and technical information is a tool for the distribution of knowledge within the national community.

That is why we have planned an endowment of 70 million francs in 1982 under this heading, as against 50.6 million francs in 1981--i.e., an increase of 38.3 percent.

9498
CSO: 3102/104

PRESIDENT OF BELAIRBUS INTERVIEWED ON A-320 PROJECT

Paris AVIATION MAGAZINE INTERNATIONAL in French 1-14 Nov 81 p 19

[Interveiw with Michel Viseur, president of Belairbus by AMI; date and place not given]

[Text] [Question] The A-320 program could be launched toward the end of the year or in the early part of 1982. Does Belgian industry, which is already participating in the A-310 program through Belairbus, envisage cooperating in this new program? Does it, in fact, have the means to do so, and especially the financial means?

[Answer] Your question covers two areas: one having to do with industrial capacity, and the other with financial means. As far as industrial capacity is concerned (though it may be only for the mass production phase), the situation is quite clear: in Belgium, the aeronautic construction industry has enough available potential to take its place in a new program, right from the launching envisaged for the beginning of next year. Better yet: this industry not only has the desired potential; it furthermore is asserting its wish to participate in such a program, inasmuch as load plan problems will become very serious 2 or 3 years hence.

On the level of financial means, I wish to point out that to get into the A-310 program, the manufacturers who are involved in it have already authorized important investments. And the machinery bought especially for this occasion is not overworked by the A-310 load plan. So here is a very clear case of availability of means without there being any need to go ahead with investments immediately.

The fact remains--and this is true of Airbus Industry partners on the whole--that Belgium cannot rush into such an operation without some support from public powers.

[Question] But do you think it possible to obtain this financial support, because, bearing in mind the political and economic situation currently reigning in Belgium, the environment does not seem to be the most favorable?

[Answer] I shall make just one observation: all of the politicians who are involved in the problems of a fresh start for industry have incessantly reasserted the need and importance of concentrating economic revitalization efforts on new technologies and on peak sectors, which include aeronautics.

[Question] What is the estimated cost of Belgium's participation in the A-320 program?

[Answer] In financial terms, this evaluation has not been made with much precision because it does not have anything more to go on than the estimate of industrial participation. But we, like the would-be partners, are now in the study phase of this possible participation.

But, on the whole, and at the present stage of the analysis, which has yet to be confirmed, the intention in the circles concerned would be to look for an extension of Belgian participation in A-320, or in any other future program, in the same order of magnitude as that obtained for A-310 (about 2.3 percent). And this from the same vantage point, in order to derive some profit from the material investments on which action have proceeded, and to take advantage of the know-how acquired on this occasion.

[Question] In Belgium, the aeronautics industry remains among the sectors known as national. Is this situation likely to evolve, or could it, in your opinion, evolve in terms of a regionalization movement which is already being felt in other areas?

[Answer] That is purely a political matter. And on the industrial level, the important thing, I will say, is for the budgetary financial need, linked to an industrial strategy and chosen and covered by public powers, to be cleared up in a timely manner, whether this is on a national or a regional scale.

[Question] But, bearing in mind manifestations coming especially from the Flemish Aerospace Group (FLAG), a group of Flemish manufacturers (see AMI No 810, p 19), could there be a move toward an expansion of Belairbus for the benefit of new shareholders from the north of the country?

[Answer] Before taking up this issue, I first of all want to point out that the Belgian aeronautic construction industry is a small reality. To put it simply, we essentially have two builders: SABCA and SONACA (whose size is somewhere between 1,800 and 2,000 people each). That is the first characteristic of our industry. Another characteristic: the difficulty which this industry has had at all times--and this problem is going to become crucial in 1983-1984, as I stated earlier--in maintaining its load plans. And in this regard, it is clear that the industry can be kept up only by military orders or by integration into a multinational civilian program--diversification still being, in our sector, too specific.

As it is, the expansion which you have in mind is theoretically possible. This contingency was, in fact, brought up not long ago at the Council of Ministers. In reality, there would be no objection if SABCA, which at present is not participating in the Airbus program of its own accord, should like SONACA join forces as a builder in some future program of the European consortium, if it so desired, and if, by the same token, Belairbus should expand.

[Question] You stressed Belgium's willingness to participate in the A-320 program; however, the matter of its participation in the MDF-100 program has also been discussed. What exactly is the status of this?

[Answer] As I have already pointed out, Belgium actually has reasserted its willingness and determination to pursue its participation within the framework of the Airbus programs. And the concern of its manufacturers, eager to maintain their loan plans, is to be on the lookout for potential markets, either civilian or military. Then, as far as Airbus Industry is concerned, there is a project well under way, which is the A-320. Will it come out? Answer: at the beginning of next year. There are still other projects within the European consortium which likewise could come into being.

But on the political and strictly general level, there is a constant factor: it is the limitation of the budgetary means that can be allotted to programs, no matter how much determination there may be to safeguard--and even to give preferential treatment to--the aeronautics sector. This amounts to saying that at a given time, choices will have to be made. The basis for these will be the best prospects. And here again, in Belgium there is unanimity in emphasizing the importance of the Airbus programs.

Nevertheless, if we should be given no possibility of choice within the framework of the consortium, there would still be a load plan problem, anyway--a problem, moreover, that is not peculiar to Belgian industry alone. This is the reason why other projects are being studied by the manufacturers.

But as far as I am concerned, and to return to the subject of Belgium, it seems to me to be totally unrealistic to expect that this country might get out of the A-320 program and that it will not try to get into any new Airbus program.

As a matter of fact, with respect to Belgium's possible participation in MDF-100, I wish to point out that this problem has not been the subject of any study or any planning effort--not at the industry level, at any rate.

9498
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DRIVER'S REPORT ON VOLKSWAGEN 'AUTO 2000' CARS

Paris L'ARGUS DE L'AUTOMOBILE in French 24 Dec 81 pp 1, 3

Undeniably, the VW Auto 2000 project is very broad in scope. To be convinced of that, one had but to see the four vehicles made available to French journalists during the testing day: besides one of the six complete Auto 2000 prototypes, there was a three-cylinder diesel engine with turbosupercharger under the hood of a Scirocco coupe; another three-cylinder diesel equipped with a "shock wave" Comprex supercharger in a Golf, and finally a four-cylinder gasoline engine of 1,050 cm^3 (that of the new Polo) supercharged by a Rootes type volumetric compressor in another Golf. When we learn that the "packet" allotted to VW by the Federal Research Ministry is in the neighborhood of DM 32.5 million, we can measure the abundance of the official manna, but we are forced to recognize that the investment (50 percent of the total) has been productive. To build in two years an entirely new car, master new techniques and exotic materials, create an anti-skid ABV /expansion unknown/ braking system, a plastic and aluminum rear suspension, an automatic tire-pressure control, a microprocessor-regulated heating system, absolutely new seats, resin wheel rims, and a revolutionary digital driver information technique assisted by a synthetic voice--and all that in addition to three exceptional engines, is really not bad! The strangest thing is that we are still so reticent about older VW inventions--semiautomatic twin-clutch transmissions and disengageable flywheels--which are reintroduced into the VW Auto 2000.

Difficult Tests

First of all we wish to thank the press services of VW France and VW Germany, as well as the head of research, Dr Seiffert, who allowed us to test these "year 2000 cars." After the extraordinary Audi Auto 2000, which we were able to drive at high speed on the open road, VW provided us with four intelligently selected cars. There was the present engine (three-cylinder diesel with direct turboinjection) of the Auto 2000 in a Scirocco chassis: thus we had a perfect measure of what is contributed to the Auto 2000 by aerodynamics and a lightweight body and transmission. In the lighter Golfs, other possible engines for the Auto 2000, not yet frozen in their design, provided a good demonstration of the limits of the turbosupercharger solu-

tion and broadened, as the research contract provides, the field of engine experimentation--a costly one.

Unhappily, snow and glaze covered the roads of the 15-km circuit we were to drive many times; and if one adds that the beet harvest was in full swing, a road under repair, and traffic intense, then the full difficulty of the test, but also the immense confidence placed in us, can be appreciated. Thank you again.

The VW Philosophy

The Auto 2000 project began at VW in 1978. It consisted in providing a technical answer to a simple question: what will the car of the year 2000 be like?

The elements of the answer constituted a set of specifications approved in 1979 by the German Ministry of Research and Technology, which wished to further progress in several directions: fuel economy, energy economies in manufacture, and reduced pollution and noise, without renouncing passive safety, together with development of innovations capable of rapid integration into mass production--in a word, to square the circle, for it was necessary to be ready for Frankfurt 1981.

All that, however, was not enough for VW, which added other imperatives summed up by Dr Seiffert: "The car of the future must not lessen the pleasure of driving." The implication is that to sell cars--and that is their role--the customer must be tempted by other arguments than economy. It is also necessary to produce at low cost, by humanizing the work (for example, no more raised-arm work stations!). Plainly, VW has set the hurdle very high, and in all disciplines contributing to the development and sale of an automobile.

Modular Concept

In the Auto 2000 project, each manufacturer built a car in his own range: Mercedes a large one, Audi a large mid-size, and VW a mid-size, since the universities are entitled to dream a little more.

So the Wulfsburg research department began work on a large Golf of 780 kg empty weight, with a useful load of 400 kg, a length of 4.015 m, width of 1.670 m, height of 1.353 m, and an extreme width of 1.455 m forward and 1.426 m at the rear. Beyond the aesthetics of the body, to which we shall return, the point of interest is its modular conception. As with the Peugeot Vera, Fiat VSS Idea, and Audi Auto 2000, steel is no longer the sole structural constituent. The VW 2000 body is composed of three major elements, the only ones made of steel: the floor, with forward unit; the side panels; and the roof with stiffening beams.

As in the Fiat VSS, this "reticular cage" is sufficient to offer the needed resistance to torsion and flexion; the rest--front, back, and doors, is

bolted. In sequence following fitting of doors and painting, the pre-assembled plastic components are added (front, back, and hatch), then those of the underframe, with wheel slots and integrated fender wells.

The enormous advantage of this construction is that it humanizes the work as it facilitates it, and that it is an essential factor of lightness and corrosion resistance.

Aesthetics and Aerodynamics

To consume less fuel means to slip through the air. For the Auto 2000, Wulfsburg nas innovated in body design: while it is usual to try to "aerodynamicize" (sic) a handsome and comfortable body, the reverse has been done here. The starting point was the wind tunnel, with analyses of "volume at quarter-scale" approximating the proportions of mid-size cars. The model which appeared best was enlarged to actual size and measured: its Cx (drag coefficient) of 0.16 was excellent. Equipped with wheels, it reached 0.18, to rise to 0.25 for the definitive operational car.

Between those two extremes, the project had made many round trips to and from the styling department and the aerodynamicists, and that is understandable. The tear-drop shape, which almost produces a "unit volume" due to the very slight break in slope between the engine hood and passenger space, does pose a few problems at the back. By a judicious dividing of the rear windows (which adds importance to the new Scirocco), the stylists have lightened the rear, and after following an Auto 2000 for several dozen km, we perforce admit that one gets used to it quickly.

While a Golf Formula E has a Cx of 0.38 and a CxS [expansion unknown] of 0.70, the 2000 falls to 0.25 and 0.47. It is remarkable, though most of the tricks are known: perfect sealing of the forward face; good handling of air circulation for engine cooling and heating; absence of gutters or protruding edges, thanks to windows mounted "outside" the doors or bonded as are the triangular rear windows; smoothness of underside, etc.

Chassis and Suspension

Designed to be built and assembled by robots, the chassis-suspension unit closely derives from that of the Golf. It was a necessity, given the wish to preserve "the pleasure of driving." Nor was there, on the other hand, any skimping in choice of materials, or in lightening.

At the front, the pivot bearing, with strut anchoring sleeve, is of light alloy: there is a saving in non-suspended weight and a reduction in the number of parts, which was imperative for recovering the higher cost of the light metal. Though the weight saving is 70 percent, the possibility remains of installing, very rapidly, production parts having much greater resistance.

At the rear, they were not heavy-handed either! The "flexible" axle with wheels taken from the Golf is this time made of plastic (two shells) reinforced by a sheet of bonded aluminum. Though the volume of the component is much greater, the weight is reduced by 50 percent, and resistance to corrosion is unlimited.

The rims have been given the same slenderizing treatment: made of a composite plastic, they are lighter by 40 percent. For our test, they were replaced by strong alloy rims, for safety reasons. A Citroen SM having won the Moroccan rally with such plastic rims by Michelin, we wager VW will soon attain sufficient reliability and low cost.

Engines

A body can be lightened to the utmost, but an engine is still needed to give life to the car! VW has worked in two major directions:

Super-economy, with a three-cylinder supercharged diesel of 33 kW (45 hp)

Comfort and more lively performance, with a four-cylinder supercharged gasoline engine of 55 kW (75 hp).

The principle of supercharging has proven itself: with a small engine, hence with light weight and minimal friction, remarkable power is obtained. For the diesel, therefore, VW has drawn from its stock, taking a 1600 cm^3 four-cylinder engine and literally "sawing" a cylinder. Entirely of light metal, unlined and treated with Nikasil, the three-cylinder unit was given a direct-injection head (a gain of 10 to 15 percent), but no balancing shaft. This compensating shaft technique, very current in Japan, was tried on a test bench (with an external shaft), but severe vibration stress at engine mounts, even at the smoothest operating speeds, led to its rejection. Bravo! For though the noise of direct injection (greater than that of engines with precombustion chambers) is audible at idle, it is much less so at speed, with vibration staying at an acceptable level comparable to that of good diesels 10 years ago.

The gasoline engine is the 1050 cm^3 power plant of the new Polo, with supercharger added. It thus develops 75 hp, or the power of a 1500 cm^3 of conventional type without supercharger (with 50 hp/l, or the European average).

Superchargers

For speed, VW has put a turbosupercharger on the three-cylinder diesel. Garrett and KKK /expansion unknown/ have broad enough lines so that the right turbo is immediately available, but the Wulfsburg technicians are visibly excited by the Comprex. At a 20 to 1 compression ratio the turbo engine develops 45 hp at 4,000 rpm, a torque of 98 Nm at 2,500 rpm, and has a good specific consumption between 218 and 230 kWh between 1,700 and 3,000 rpm.

Initial tests with the Comprex shock wave supercharger, though still with a precombustion chambered head, gave excellent results: 59 hp at 3,600 rpm and 130 Nm at 2,000 rpm. Still better results are expected when direct injection is installed.

For the gasoline engine, the good old volumetric supercharger of our fathers' time was reverted to: of Roots type, it was designed by VW (as was also its feed system) and built by Aerzner. The novelty is that it is driven by a V-belt and a pulley with variable circumference, thus giving infinite ratios in relation to cransshaft speed, allowing a constant boost pressure over practically the entire range of engine speeds.

At the Wheel of the Auto 2000

Before trying out the Auto 2000, we drove the Scirocco with three-cylinder turbo-diesel engine. It was very disappointing. The 45 hp had trouble moving the coupe, though it had a good Cx. It was impossible to catch up to the Auto 2000 ahead of us, which made us all the more avid to try it.

As to comfort and passenger space, nothing was slighted in the Auto 2000: the plastic seats, with foam upholstery of several grades, are excellent; the new digital instrument panel is readable, even though handling of the controls is still unfamiliar to us; and the heating system, its air mixture controlled by microprocessor, is remarkably efficient.

The usual explanations completed, there is no need to turn on ignition: simply go into first (without disengaging, for there is no clutch pedal!), and accelerate. During short stops, both car and engine are stopped, but the flywheel continues to idle, the two systems linking it to the engine and gear box being disengaged. On engaging first and accelerating, an electronically controlled pneumatic assist engages the first mechanism and actuates the injection pump; the engine, again impelled by the flywheel, starts almost instantly; the second mechanism engages, and the car moves off.

Since the wheels were resting on a thick layer of glaze, we did not dare accelerate fully, and we stalled! The second time, we started off correctly, but it was a "jackrabbit" start. From then on, shifting up through the speeds is done conventionally.

Start-Stop and Cutoff

On the highway, in fifth gear and at good speed, the engine stops instantly as one lifts one's foot, the Auto 2000 continuing on its momentum. It is impressive, especially when this happens on a slippery downgrade, and one would like to have a few horses underfoot. At stoplights, the engine likewise stops, then starts up again with pressure on the accelerator, first speed engaged. This resembles the start-stop of the Formula E, which is currently sold, except that engine stop is automatic rather than pushbutton controlled.

Though we are accustomed to that semi-automatic gear box, and to the stop-start, we have not yet assimilated the cutoff on release of accelerator pressure, which is certainly very economical of fuel, but which deprives one of all motor function, at times in critical situations, and makes for anguish while waiting for the engine to cut in again. Be that as it may, such intermittent operation brings actual fuel consumption close to that for normalized speeds: 4.2 l in town, 3.3 l at 90 kph, and 4.9 l of gas-oil at 120 kph. Where are we headed if very low fuel consumption figures are obtained, and then proven on the highway?

By fingering the minicomputer which serves as an instrument panel, one can elicit a great variety of data which in theory help to achieve better driving. But can one really drive badly in this Auto 2000, so light and well profiled that the asthmatic Scirocco engine is here much more spirited!

Comprex and Volumetric Supercharger

No need to mince words--the Comprex is the foot on the gas. The three-cylinder engine has its noise "chopped" by the Comprex, which adds a slight whistling, as if one were hearing the purring of six cylinders! At the slightest demand, the car surges, giving proof of an excellent torque, and behaves most pleasantly.

The sound pickup inspires confidence, the Golf roars with ease; we understand the technicians' preference, for it is also our own, and we rejoice in anticipation, knowing that the Auto 2000 will be equipped with the three-cylinder Comprex.

The same vivacity delights the driver of the four-cylinder gasoline version. Engine sound is pleasant, and pickup, thanks to the volumetric supercharger, is instantaneous, straightforward, and powerful. A test installation enabled us to experience the whole contribution made by the variable-feed supercharger: it operated only in response to urgent power demand and strong accelerator pressure, but at constant speed it could be forgotten. That small marvel seemed to us to have little tinkering about it, and to be close to the production stage, and we catch ourselves dreaming and hoping that it will indeed soon be in production, with its marvelous anti-ping ignition, which is a great VW innovation in this field. Also noteworthy is the fact that heat problems in this engine are so well mastered that jackets are cooled by water on only half of their surface!

At all events, there is not the slightest doubt: the Auto 2000, which was to reach 150 kph, 0 to 100 kph in 20 seconds in the diesel version; and 180 kph, 0 to 100 kph in 12 seconds in the gasoline version, will do so with ease, and the Comprex version surely better.

Conclusion

To evoke all the other technical particulars of the engines, the very considerable passive safety, the ABV antiskid braking, the artful aspects of

the passenger space, the thin Makrolon windows, and the technology of the hood and hatch--all that would lead us far, as rich as these cars are, for that is their vocation, in new technologies.

The important thing is to take note that in two years the "cars of the year 2000" have been built. If they are not perfect, they show the path to be followed. A great many innovations are easily and immediately applicable, and within 3 to 5 years they will be in production, with all the economies they will bring about. Others, which necessitate considerable modifications of industrial structures (the "quid" of plastics and fibers?), will come in their time, as determined by events and oue energy future; but is not the main point, when facing a new problem, to bring to it a solution already known and proven?

In all domains, VW is ready.

Bayer's Valuable Assistance

Bayer, the renowned chemical firm of Leverkusen, broadly collaborated in various Auto 2000 projects. It put its incomparable knowledge of plastics at the service of VW, Daimler-Benz, and Unicar engineers, Unicar being the fruit of cooperation by German universities. Notably absent was Audi, which preferred to develop the sector of "sandwich" materials.

At VW, various subassemblies were made from a base of Bayer technopolymers. Also perfected was an all-plastic seat, of which the adjustable shell is of polyamide strengthened with glass fibers, and the upholstery of polyurethane which hardens with cold. Polycarbonate with a scratch-proofing treatment was used for the fixed side windows. Forward and rear body panels are constituted by a support of polyester resin strengthened by glass fibers, and an elastic coating of polyurethane foam with integrated Bayflex skin. The car is painted entirely with a supple polyurethane paint especially perfected to compensate for the different expansions of steel, aluminum, and plastics.

Technically, it is noted that the Bayflex used for the front of the VW 2000 remains flexible between -20 and +65 degrees C. Bayer states that its resistance to corrosion and aging assures long life for those components, but this is contested by many engineers who think it is still too soon to judge.

These methods offer great freedom in design: the front of the VW is a single piece, cast by the RIM (Reaction, Injection, Moulding) process, and replaces numerous metal parts.

The mechanical properties of the unit are remarkable, thanks to an integral front of polyester resin (Leguval), strengthened by glass fibers varying in quantity with stress load, of modulated thickness from 2 to 6 mm. This multifunctional unit, easily assembled in production with six bolts, can be mass produced from SMC (Sheet Moulding Compound) with a Leguval base.

This SMC technique, used by Fiat-VSS and Peugeot-Vera, is also debated. Audi rejects it, and the Americans are now abandoning it, at least in the thick coating process.

6145
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ALL-COMPOSITE WING UNDER DEVELOPMENT IN SWEDEN

Wing Described

Stockholm NY TEKNIK in Swedish 14 Jan 82 pp 8-9

[Article by Karl G. Jonsson: "The Wing Made Entirely of Plastic--Soon It Will Fly in Sweden"]

> [Text] Malmo. A high-lift wing made entirely of plastic. The former head of Malmo Flygindustri, Rudolf Abelin, is producing one. It is the first time that such a large composite [laminated] wing section has been built in Sweden. During this year a plastic wing will be flying.

The wing is part of a STU [National Board for Technical Development] project, with a certain connection to Saab-Scania's MULAS project, which was presented a couple of years ago. But Rudolf Abelin says that this wing is purely a research project. What is needed is simply to verify wind tunnel data with flights and tests on the wing profile, and to learn how an all-composite wing stands up in its real environment.

The first large wing section which would fit on a MULAS is already at the FFA [National Aeronautical Research Institute] in Stockholm for rigidity tests. Now the construction of a smaller wing has begun, which will be test flown on a Saab MFI 15 Safari. One wing will be load tested at FFA.

Curved Surfaces

The wing girders are built of carbon fiber laminate with fiberglass laminate on the curved surfaces.

[Portion omitted here] new in connection with flying," said Rudolf Abelin. "But previously it has mostly been with smaller parts in combination with metals. We believe that our first wing section is the largest individual section built entirely of composite material."

This first wing section is the load-bearing midsection without wingtips, and is comparable in size to a DC-3 wing. The entire wingspan with wingtips would be about 17 meters.

Begin at the Other End

To build with laminated materials is to build strongly and lightly, but hardly cheaply. This is a fact which they will try to change at Malmo.

"The laminate technology is and has been an extremely advanced technology. Laminates are used where traditional materials are no longer adequate.

"We are trying to begin at the other end. We are using laminates in order to build simply and cheaply. Not to fly with double the speed of sound. And we use carbon fibers only where we need them!"

The big mistake usually made when working with laminates, according to Rudolf Abelin, is that they work with it as though it were sheet metal. They do not utilize the advantages of the material.

90 Percent Disappears

"The technique of composites is very similar to construction with wood, where one is also dealing with fibers. Except that instead of reducing down, we are building up."

Rudolf Abelin, who is not the only one on this project who has had experience in the wooden aircraft era, estimates that they only work off one to two percent of the laminate material. When machining metal parts it is not unusual when 90 percent of the material disappears.

"Therefore we can say that our material is more expensive before, but cheaper after processing."

Furthermore the tool costs are considerably lower-- perhaps one-tenth of the cost of building with sheet metal.

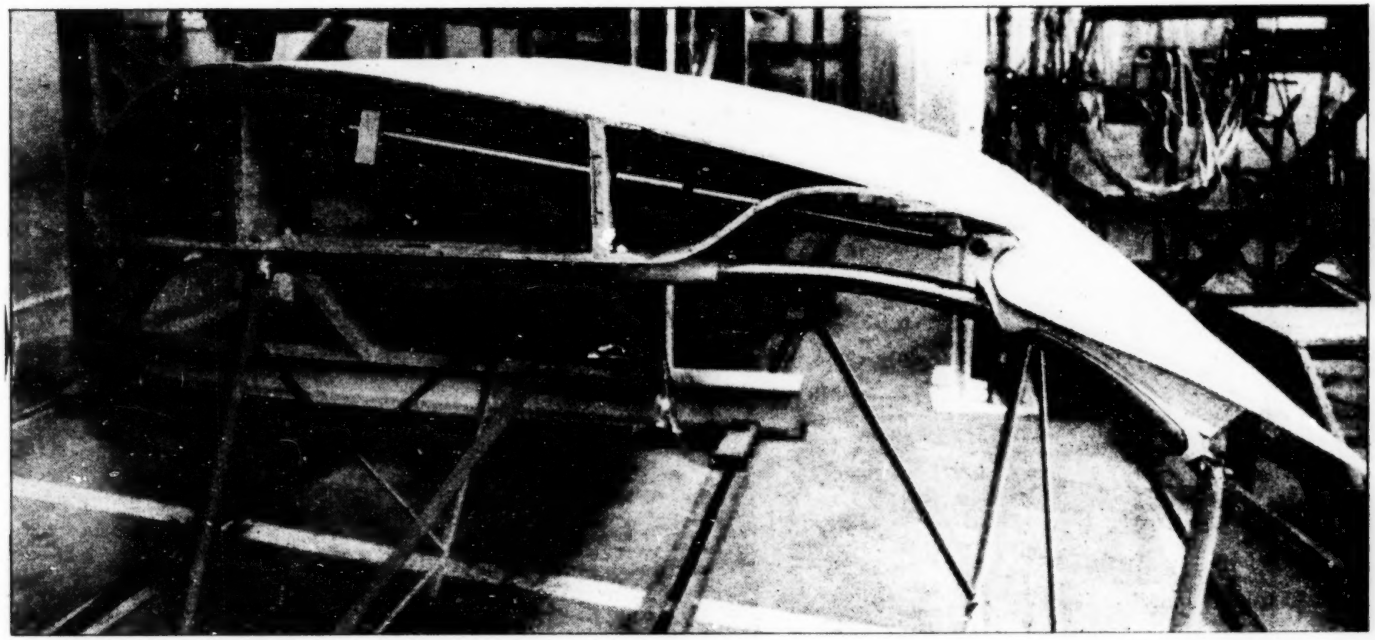
Higher Precision

Among other things, the research program at Malmo is trying to find better combinations of reinforcements and plastics. They have also developed a simpler and cheaper way of production by extending wing sections. For the same price they get greater precision. Wing panels and girders are built up one at a time and glued together into a strong unit. The wing profile, designed by Sven-Olof Ridder, gives almost double the lift of a conventional wing of the same size.

This is not only because of the different profile, but also because one-third of the weight can be saved, thereby enabling increased wingspan.

The wing is very blunt and has a flat underside. A built-in flap increases the wing surface by 20 percent when in the extended position.

The profile in itself is not unique--on the other hand it is the first time that wing and flap are constructed as an integral system. Normally the wing is designed and tested by itself. Thereafter a suitable flap is constructed.



Caption: Section of the wing which will fly on a Saab MFI Safari later this year. In the background is the large laminated wing section.

The wing will function in the lower speed range--up to 400-450 km per hour.

The first large all-composite plane--America's Learfan--is already flying.

"But we could have been several years ahead of them," said Rudolf Abelin, "if Malmo Flygindustri had not been shut down."

MULAS Project

Stockholm NY TEKNIK in Swedish 14 Jan 82 p 9

[Article by Sven-Olof Carlsson: "What Was MULAS?"]

[Text] MULAS (Multi Utility Light Aircraft System)--the project was a big idea for a transport system for large areas without roads, primarily in underdeveloped countries. In the system there was to be a "flying truck"--MULAS--for heavy transport, and a little light aircraft for such things as dropping food in flight, modeled after Gustaf von Rosen's food bombings in Ethiopia. There was also a plan for agriculture and forestry, and special adaptations of aircraft for a number of different transport tasks.

Saab-Scania's concept for such an aircraft--called Transporter--and Saab collaborator Rudolf Abelin's MULAS were then closely related.

But Saab's Transporter became the Saab-Fairchild SF 340, an advanced but more traditionally built feeder aircraft, primarily for passenger transport between the fine permanent airports of the western world.

Saab removed its support from the project for the aircraft intended for simple airports in inaccessible places. And the MULAS project lost its momentum.

But some development projects with their origins in the MULAS concept still live, and are waiting for new initiatives.

The most timely of these is wing and rudder construction of fiberglass and carbon fiber laminates.

Some of the others participating in these development projects with Rudolf Abelin are STU, FFA and Matasi Plast in Malmo.

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